

Results

The study compared 75 patients divided into three groups. Each consists of 25 patients according to the caudally injected drug. The study compared the analgesic and hemodynamic effects of bupivacaine alone, bupivacaine with neostigmine and bupivacaine with ketamine when injected caudally.

The demographic data:

The demographic data of the study groups are shown in **(table 9)**. There were no statistically significant differences between the three groups as regards age, ASA, weight and sex.

Table (9): Comparison between three groups as:

		Group I		Group II		Group III		Test of significance	p
		mean	SD	mean	SD	mean	SD		
Age		6.2880	3.29195	5.7280	3.23258	5.9200	3.54941	0.2	>0.05
Weight		14.0400	1.24097	13.8120	.95058	12.00	15.50	0.5	>0.05
		No.	%	No.	%	No.	%		
Sex	M	22	88	23	92	22	88	0.4	>0.05
	F	3	12	2	8	3	12		
ASA	1	15	60	16	64	17	68	0.4	>0.05
	2	10	40	9	36	8	32		

Duration of postoperative analgesia:

As regards *duration of postoperative analgesia* group II (Bupivacaine neostigmine group) had the longest duration of analgesia with a mean of 17.8400 hours, with a statistically highly significant difference ($P < 0.001$) compared with group I (Bupivacaine group) and group III (Bupivacaine Ketamine group) (**Table 10&Fig13**).

Group I (Bupivacaine group) had the shortest duration of analgesia with a mean of 5.0280 hours with a statistically highly significant difference ($P < 0.001$) compared with the other two groups.

Group III (Bupivacaine Ketamine group) follow Group II with mean duration of analgesia 11.1920 hours with a statistically highly significant difference ($P < 0.001$) compared with the other two groups.

Table (10): Comparison between three groups as regards duration of postoperative analgesia:

	Mean	Std. Deviation	Minimum	Maximum	f	p
Group I	5.0280	0.63214	4.00	6.00	747.6	<0.001
Group II	17.8400	1.39224	16.00	20.00		
Group III	11.1920	1.33445	9.00	13.00		

*P value: significant

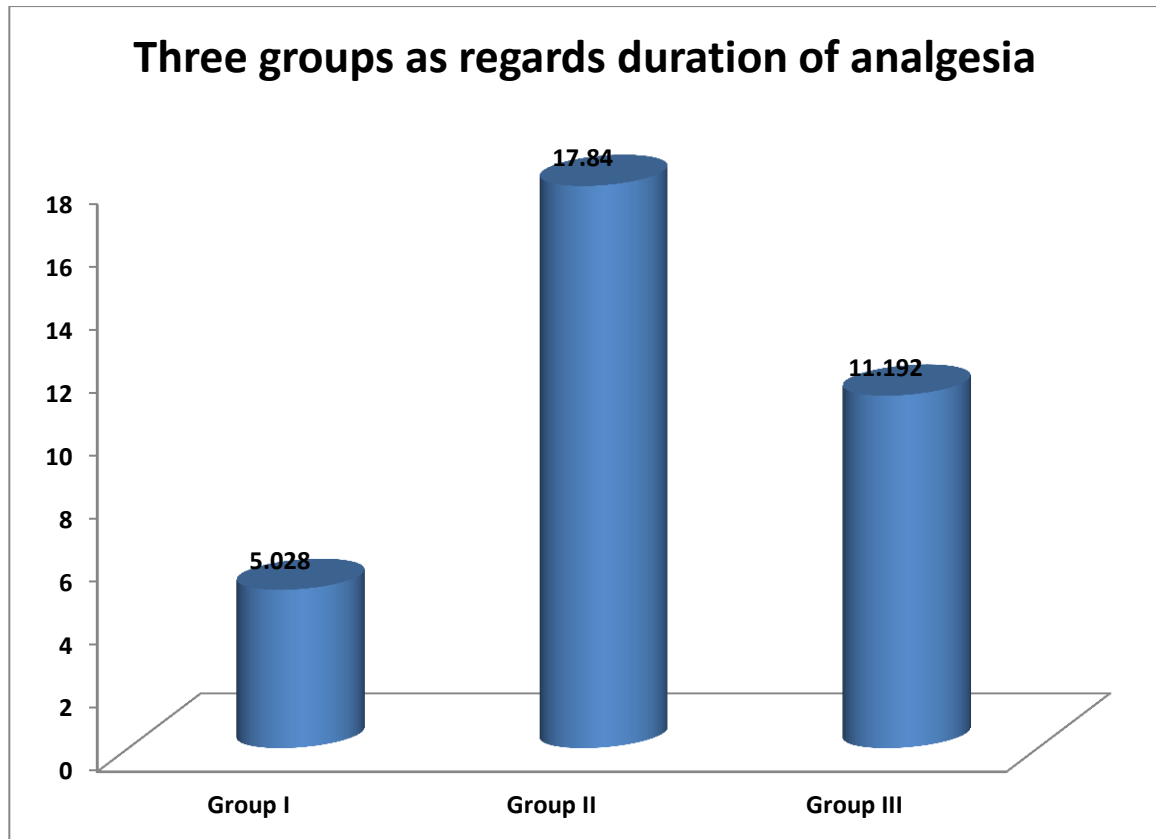


Fig. (13) Shows Comparison between three groups as regards duration of postoperative analgesia.

Pain score:

At 4 hours: The scores of the OPDS scale ranges from 1 to 4 in Group I and the scale was 0 in Group II. And the scale ranges from 0 to 1 in group III. So, there is statistically significant difference between both groups II and III with group I. And no statistical Difference between groups II and III.

At 6 hours: The scores of the OPDS scale are from 3-6 in group I, 1- 2 in group II and the scale was 2 in group III. So, there is statistically significant difference between both groups II and III with group I. There are increased pain scores in group I. And no statistical difference between groups II and III.

At 8 hours: The scores of the OPDS scale are from 5-7 in group I. And ranges from 2-3 in both group II and III. So, there is statistically significant difference between both group II and III with group I.

At 12 hours: The scores of the OPDS scale are from 6 - 8 in group I, 3 in group II ,and ranges from 3-6 in group III. SO, there is statistically significant difference between group II with group I and III.

At 24 hours: The score of the OPDS scale ranges from 5-8 in the three groups with no significant difference in between.

Table (11): comparison between three groups as regards pain score:

		Mean	Std. Deviation	Minimum	Maximum	f	p
Pain Score 4 hr	Group I	2.48	0.91833	1.00	4.00	135.8	<0.001
	Group II	.0000	0.00000	0.00	0.00		
	Group III	.2400	0.43589	0.00	1.00		
Pain Score 6 hr	Group I	4.3600	0.95219	3.00	6.00	142.7	<0.001
	Group II	2.0000	0.00000	1.00	2.00		
	Group III	1.8400	0.37417	2.00	2.00		
Pain Score 8 hr	Group I	5.8800	0.83267	5.00	7.00	228.8	<0.001
	Group II	2.8000	0.40825	2.00	3.00		
	Group III	2.7600	0.43589	2.00	3.00		
Pain Score 12 hr	Group I	7.2800	0.61373	6.00	8.00	224.7	<0.001
	Group II	3.0000	0.00000	3.00	3.00		
	Group III	4.3200	1.10755	3.00	6.00		
Pain Score 24 hr	Group I	7.7200	0.75826	7.00	8.00	35.5	>0.05
	Group II	7.8800	0.88129	5.00	7.00		
	Group III	7.5600	0.91652	5.00	8.00		

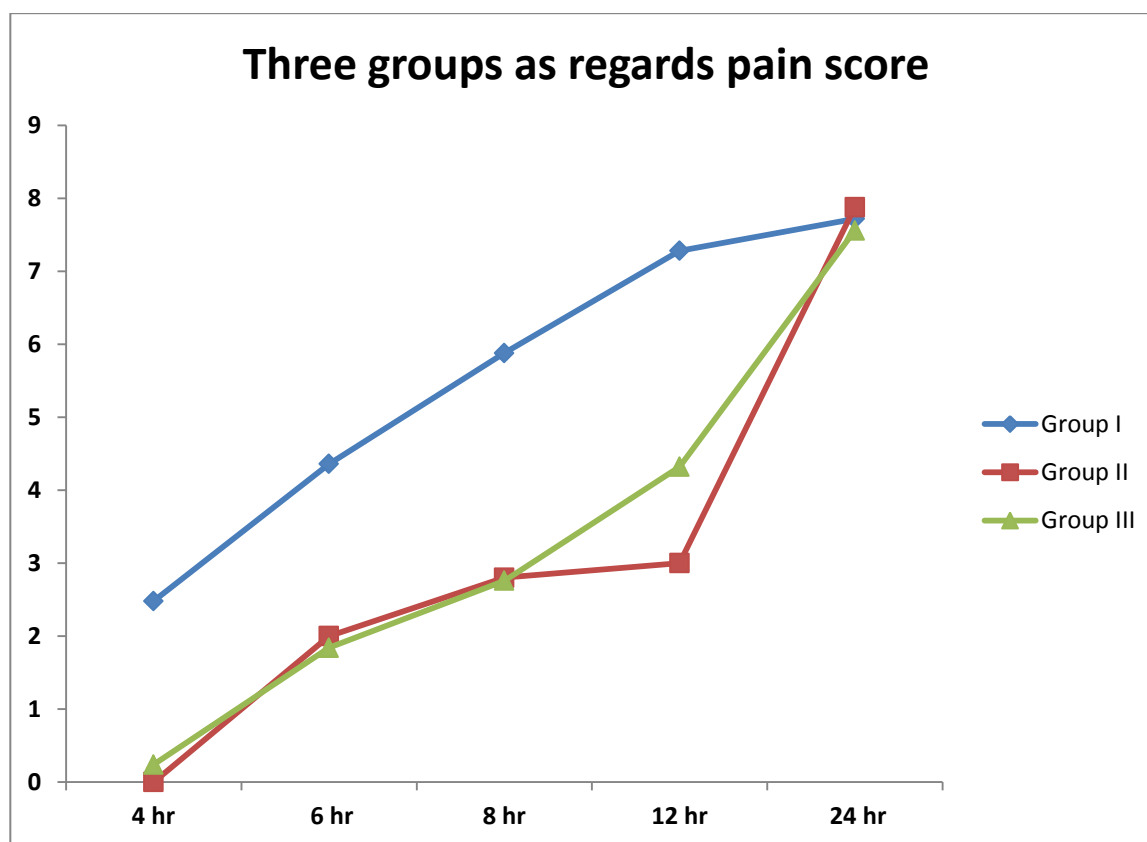


Fig. (14) Shows comparison between three groups as regards pain score:

Receiving of analgesia:

As regards *receiving of analgesic doses* in the 1st postoperative 24 hours the results showed that 25patients (100%) in group II(Bupivacaine neostigmine group) had a pain free postoperative period i.e. OPS <4 that lasted more than 12 hours during which they did not need supplementary analgesia, while 7 patients (28%) in group III((Bupivacaine ketamine group) had a pain free period of 12hours .Only 5 patient (20%) in group I ((Bupivacaine group) had a postoperative pain free period of 6 hours. Meanwhile, no patient (0%) in the three groups had a postoperative 24 hour period of analgesia **Table (12)**.

Table (12): comparison between three groups as regards receiving of analgesia

		Group I		Group II		Group III		Total		X ²	p
		No.	%	No.	%	No.	%	No.	%		
Analgesia 30 min	+	0	.0%	0	.0%	0	.0%	0	.0%	---	---
	-	25	100.0%	25	100.0%	25	100.0%	75	100.0%		
	Total	25	100.0%	25	100.0%	25	100.0%	75	100.0%		
Analgesia 4hr	+	4	16.0%	0	.0%	0	.0%	4	5.3%	8.5	<0.05
	-	21	84.0%	25	100.0%	25	100.0%	71	94.7%		
	Total	25	100.0%	25	100.0%	25	100.0%	75	100.0%		
Analgesia 6hr	+	20	80.0%	0	.0%	0	.0%	20	26.7%	54.5	<0.001
	-	5	20.0%	25	100.0%	25	100.0%	55	73.3%		
	Total	25	100.0%	25	100.0%	25	100.0%	75	100.0%		
Analgesia 8hr	+	25	100.0%	0	.0%	0	.0%	25	33.3%	75	<0.001
	-	0	.0%	25	100.0%	25	100.0%	50	66.7%		
	Total	25	100.0%	25	100.0%	25	100.0%	75	100.0%		
Analgesia 12hr	+	25	100.0%	0	.0%	18	72.0%	43	57.3%	54.4	<0.001
	-	0	.0%	25	100.0%	7	28.0%	32	42.7%		
	Total	25	100.0%	25	100.0%	25	100.0%	75	100.0%		
Analgesia 24hr	+	25	100.0%	25	100.0%	25	100.0%	75	100.0%	---	---
	-	0	.0%	0	.0%	0	.0%	0	.0%		
	Total	25	100.0%	25	100.0%	25	100.0%	75	100.0%		

Blood glucose level:

The mean values of *Blood glucose level*(mg/dl) during the first 24 hours postoperatively showed no statistically significant difference ($P > 0.05$) among the three groups (Table 13 & Fig 15).

Table (13): Comparison between three groups as regards blood glucose level:

		Mean	S.D.	Minimum	Maximum	f	p
Glucose level 30 min	Group I	64.4400	3.58329	60.00	74.00	0.1	>0.05
	Group II	64.7600	3.91876	60.00	76.00		
	Group III	64.7600	3.91876	60.00	76.00		
Glucose level 4 hr	Group I	85.1600	20.26837	69.00	140.00	0.1	>0.05
	Group II	87.2000	21.78876	68.00	135.00		
	Group III	87.2000	21.78876	68.00	135.00		
Glucose level 6 hr	Group I	129.2800	22.16890	95.00	180.00	---	---
	Group II	129.2800	22.16890	95.00	180.00		
	Group III	129.2800	22.16890	95.00	180.00		
Glucose level 8 hr	Group I	137.7600	13.35190	120.00	165.00	1.8	>0.05
	Group II	137.8000	13.29787	120.00	165.00		
	Group III	130.1200	21.63007	95.00	180.00		
Glucose level 12 hr	Group I	129.4800	21.50411	85.00	165.00	0.1	>0.05
	Group II	129.1600	26.39867	75.00	165.00		
	Group III	131.4400	23.42022	82.00	180.00		
Glucose level 24 hr	Group I	127.2400	27.66659	69.00	165.00	0.02	>0.05
	Group II	128.6400	26.83729	74.00	165.00		
	Group III	127.2000	26.17887	74.00	165.00		

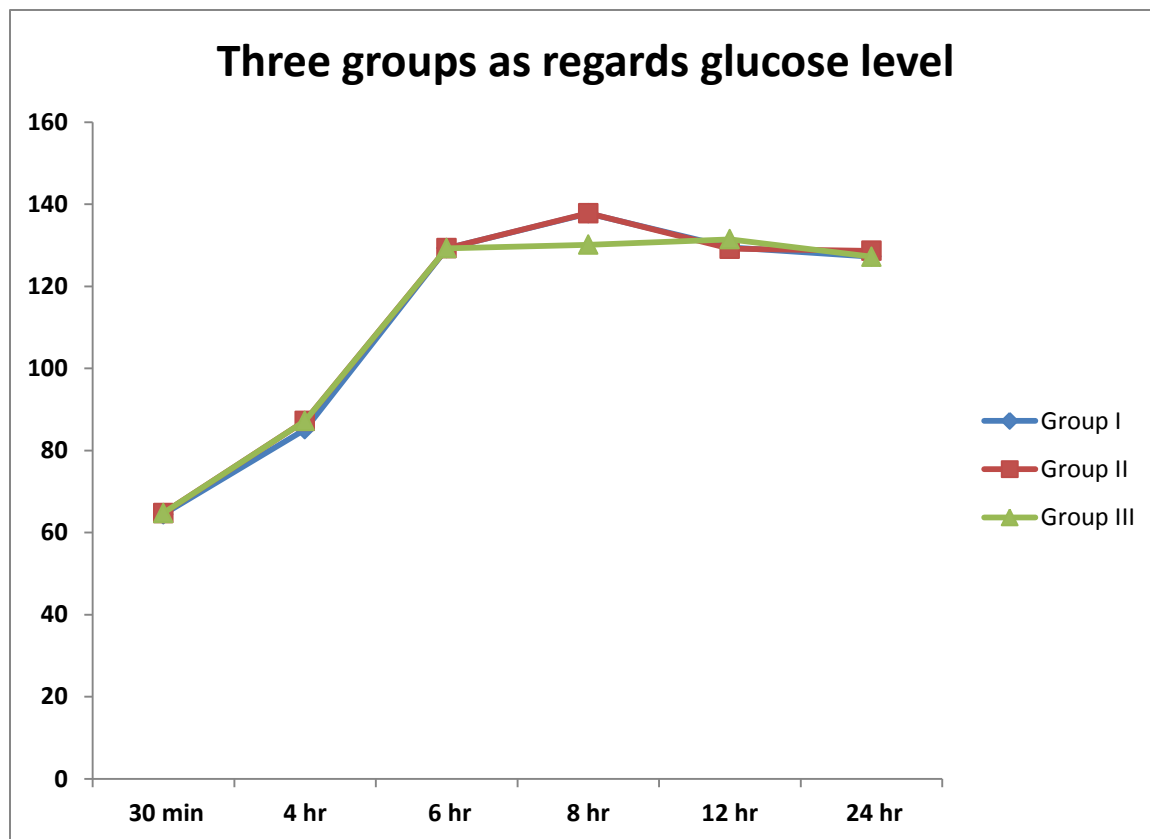


Fig. (15): shows comparison between three groups as regards blood glucose level.

Cortisol level:

At 30 min: There was no significant difference in between the three groups ($p>0.05$).

At 4 hours, at 6 hours, at 8 hours, at 12 hours: There was statistically significant difference between both groups II and III with group I. And no statistical Difference between groups II and III ($p<0.001$).

At 24 hours: Again there was no significant difference in between the three groups ($p>0.05$). (Table 14&Fig 16).

Table (14): comparison between three groups as regards Cortisol level(nmol/L)

		Mean	S.D.	Minimum	Maximum	f	p
Cortisol level 30 min	Group I	391.7000	186.52068	150.00	700.00	0.01	>0.05
	Group II	385.6680	176.19294	150.00	700.00		
	Group III	387.6760	182.72948	150.00	700.00		
Cortisol level 4 hr	Group I	606.8720	159.13338	295.60	850.00	9.02	<0.001
	Group II	387.6760	182.72948	150.00	700.00		
	Group III	454.5160	214.89301	150.00	722.40		
Cortisol level 6 hr	Group I	706.9960	140.71470	355.10	870.40	16.9	<0.001
	Group II	440.2400	164.61388	221.00	750.00		
	Group III	513.6080	192.58432	242.00	750.00		
Cortisol level 8 hr	Group I	773.7480	137.03732	410.00	900.00	21.2	<0.001
	Group II	493.3040	151.76316	320.00	800.00		
	Group III	562.3960	193.85097	300.00	800.00		
Cortisol level 12 hr	Group I	816.1040	128.52218	479.50	959.20	26.9	<0.001
	Group II	501.8080	149.82281	350.00	800.00		
	Group III	620.6120	176.56918	375.00	850.00		
Cortisol level 24 hr	Group I	885.8960	182.22950	479.00	1100.00	1.5	>0.05
	Group II	786.3080	173.97180	434.00	1000.00		
	Group III	867.2960	179.64663	418.50	1020.00		

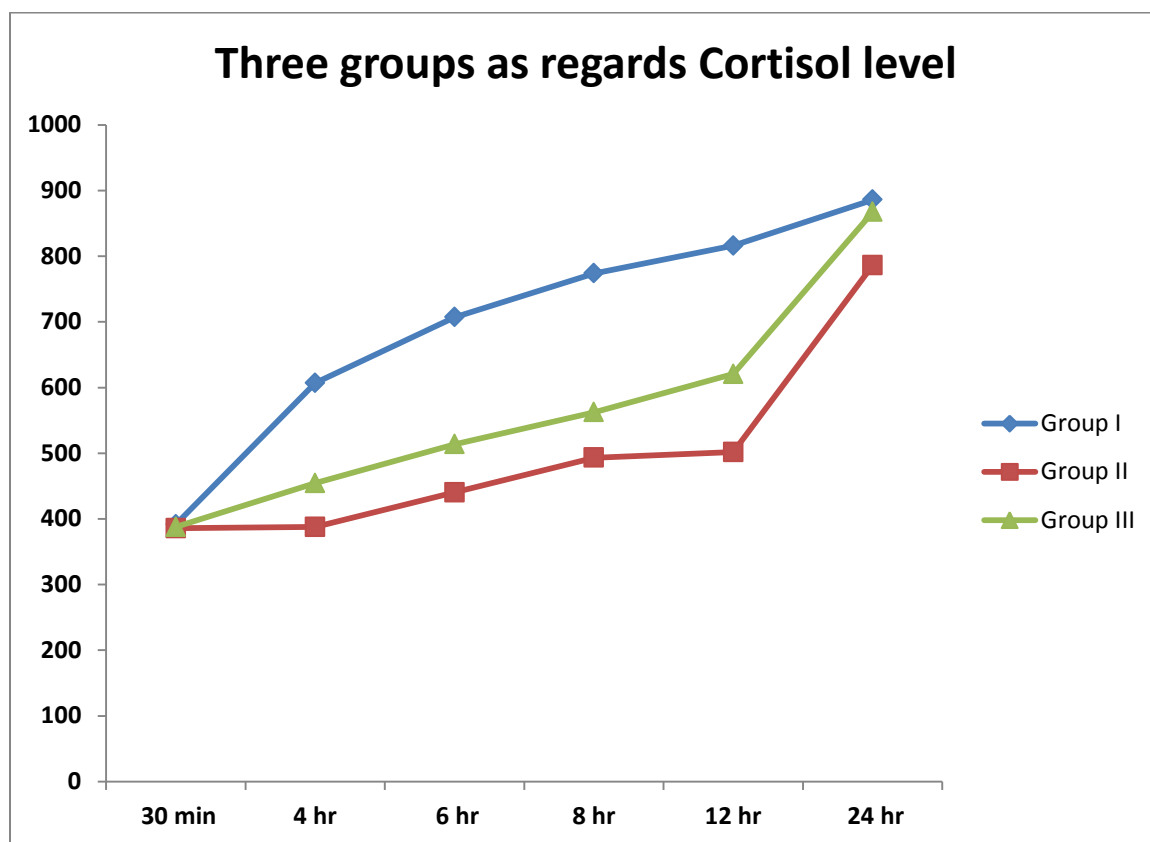


Fig. (16): shows comparison between three groups as regards Cortisol level:

Assessment of hemodynamic:

1) Heart rate (HR):

The mean values of *heart rate (HR)* during the first 24 hours postoperatively showed no statistically significant difference ($P > 0.05$) among the three groups (Table15& Fig. 17)

Table (15): comparison between three groups as regards HR:

		Mean	S.D.	Minimum	Maximum	f	p
heart rate 30 min	Group I	95.3600	6.32376	85.00	110.00	0.9	>0.05
	Group II	96.3200	7.36953	85.00	115.00		
	Group III	96.9200	10.19363	90.00	122.00		
heart rate 4 hr	Group I	98.2800	5.51906	90.00	111.00	1.1	>0.05
	Group II	97.6000	7.56086	87.00	116.00		
	Group III	97.9200	10.19363	90.00	122.00		
heart rate 6 hr	Group I	105.8400	5.52027	98.00	119.00	0.8	>0.05
	Group II	106.6400	7.66420	87.00	117.00		
	Group III	107.8800	10.29288	94.00	125.00		
heart rate 8 hr	Group I	108.0800	4.83839	100.00	115.00	0.5	>0.05
	Group II	108.2800	7.00309	88.00	116.00		
	Group III	109.0000	10.47219	98.00	129.00		
heart rate 12 hr	Group I	108.5600	4.27278	102.00	115.00	1.1	>0.05
	Group II	110.0800	7.32530	88.00	118.00		
	Group III	112.0000	10.47219	98.00	129.00		
heart rate 24 hr	Group I	108.5600	4.27278	102.00	115.00	0.8	>0.05
	Group II	107.2000	7.84219	95.00	125.00		
	Group III	109.2400	9.69656	100.00	129.00		

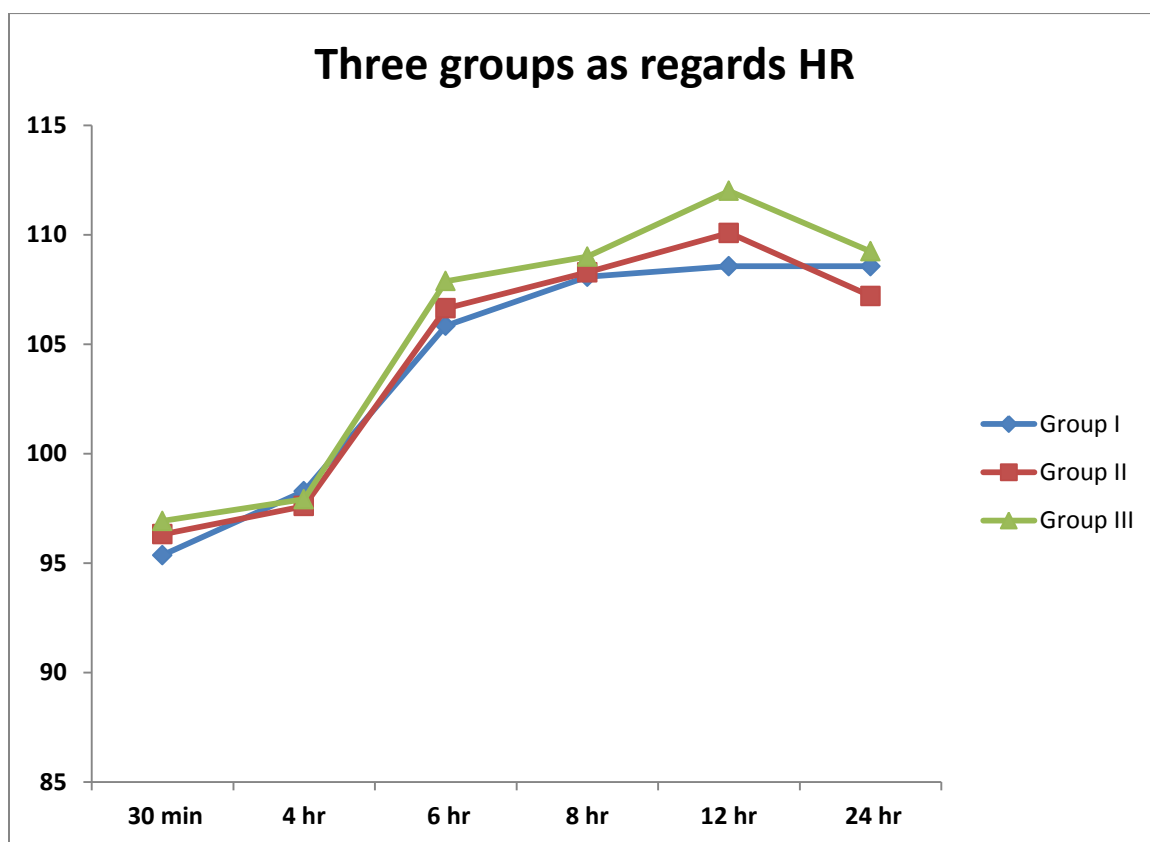


Fig. (17): Shows comparison between three groups as regards HR.

2) Mean arterial blood pressure:

The mean values of *mean arterial blood pressure* during the first 24 hours postoperatively showed no statistically significant changes among the three groups ($P > 0.05$) (Table 16&Fig.18)

Table (16): comparison between three groups as regards Bl.P:

		Mean	S.D.	Minimum	Maximum	f	p
Bl.P(mean)30min	Group I	71.7200	3.24705	66.00	80.00	0.1	>0.05
	Group II	71.5200	3.38034	66.00	80.00		
	Group III	71.9600	3.91024	66.00	81.00		
Bl.P(mean)4 hr	Group I	74.6400	3.59258	68.00	82.00	1.9	>0.05
	Group II	72.8000	3.13581	68.00	82.00		
	Group III	73.0800	3.95727	67.00	83.00		
Bl.P(mean)6 hr	Group I	76.5600	3.84144	69.00	84.00	1.9	>0.05
	Group II	74.5200	2.93144	70.00	83.00		
	Group III	75.4400	4.14407	69.00	86.00		
Bl.P(mean)8 hr	Group I	78.3600	3.21299	72.00	85.00	1.1	>0.05
	Group II	77.8000	2.94392	72.00	85.00		
	Group III	76.4400	4.14407	69.00	86.00		
Bl.P(mean)12 hr	Group I	79.9200	2.87112	75.00	85.00	1.4	>0.05
	Group II	77.8000	2.94392	72.00	85.00		
	Group III	78.0000	4.52769	71.00	90.00		
Bl.P(mean)24 hr	Group I	79.9200	2.87112	75.00	85.00	0.8	>0.05
	Group II	81.0000	2.73861	76.00	87.00		
	Group III	81.1200	4.89319	70.00	91.00		

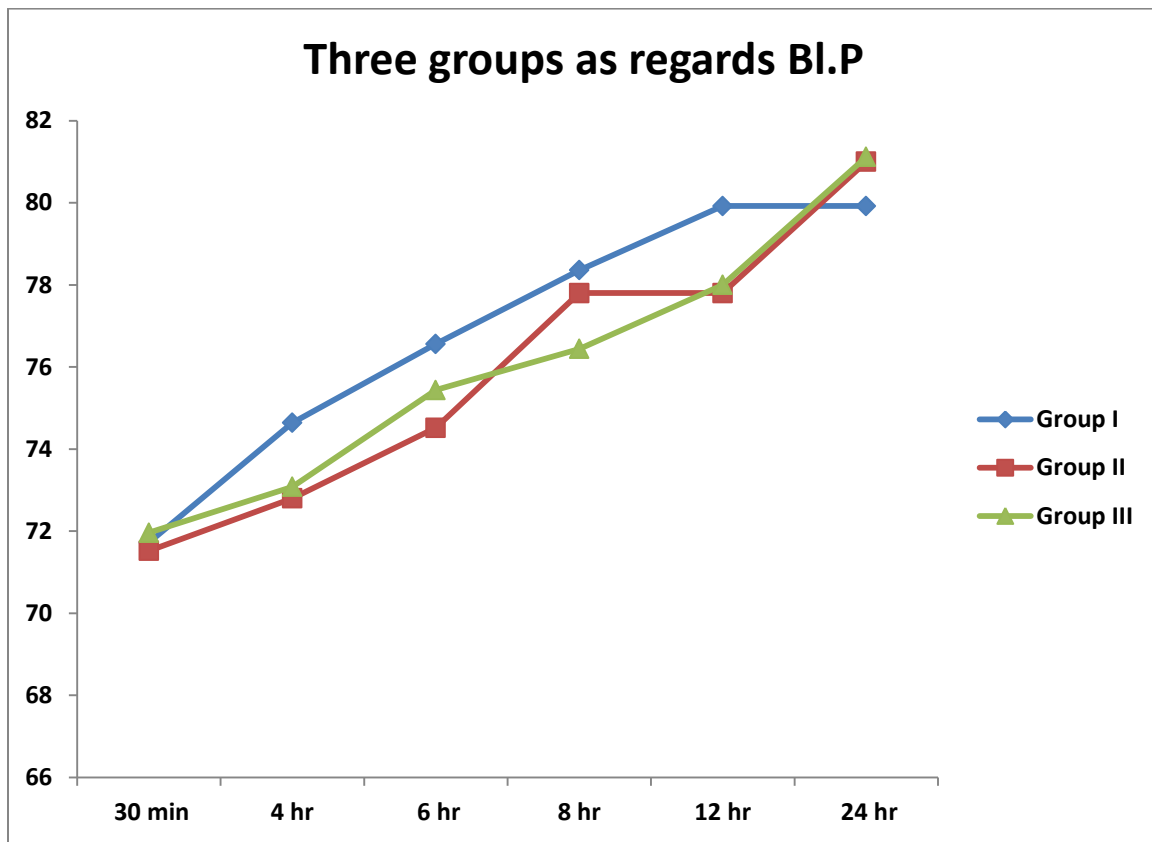


Fig. (18) Shows comparison between three groups as regards Bl.P.

3) Oxygen saturations:

Showed no statistically significant changes during the course of the present study among the three groups ($P > 0.05$) (**Table 17&Fig19**). None of the patients showed arterial oxygen saturation less than 95% along the whole study period.

Table (17): comparison between three groups as regards SPO2:

		Mean	S.D.	Minimum	Maximum	f	P
SPO2 30 min	Group I	98.1200	1.56312	95.00	100.00	0.1	>0.05
	Group II	98.2800	1.54164	95.00	100.00		
	Group III	98.2000	1.60728	95.00	100.00		
SPO2 4 hr	Group I	98.3200	1.31403	96.00	100.00	0.01	>0.05
	Group II	98.3600	1.38082	95.00	100.00		
	Group III	98.3600	1.49666	95.00	100.00		
SPO2 6 hr	Group I	98.5600	1.26095	96.00	100.00	0.3	>0.05
	Group II	98.6400	1.15036	96.00	100.00		
	Group III	98.3600	1.38082	95.00	100.00		
SPO2 8 hr	Group I	98.5600	1.26095	96.00	100.00	0.2	>0.05
	Group II	98.4000	1.35401	95.00	100.00		
	Group III	98.6400	1.15036	96.00	100.00		
SPO2 12 hr	Group I	98.6000	1.22474	96.00	100.00	0.03	>0.05
	Group II	98.5600	1.26095	96.00	100.00		
	Group III	98.6400	1.15036	96.00	100.00		
SPO2 24 hr	Group I	98.5600	1.26095	96.00	100.00	---	----
	Group II	98.5600	1.26095	96.00	100.00		
	Group III	98.5600	1.26095	96.00	100.00		

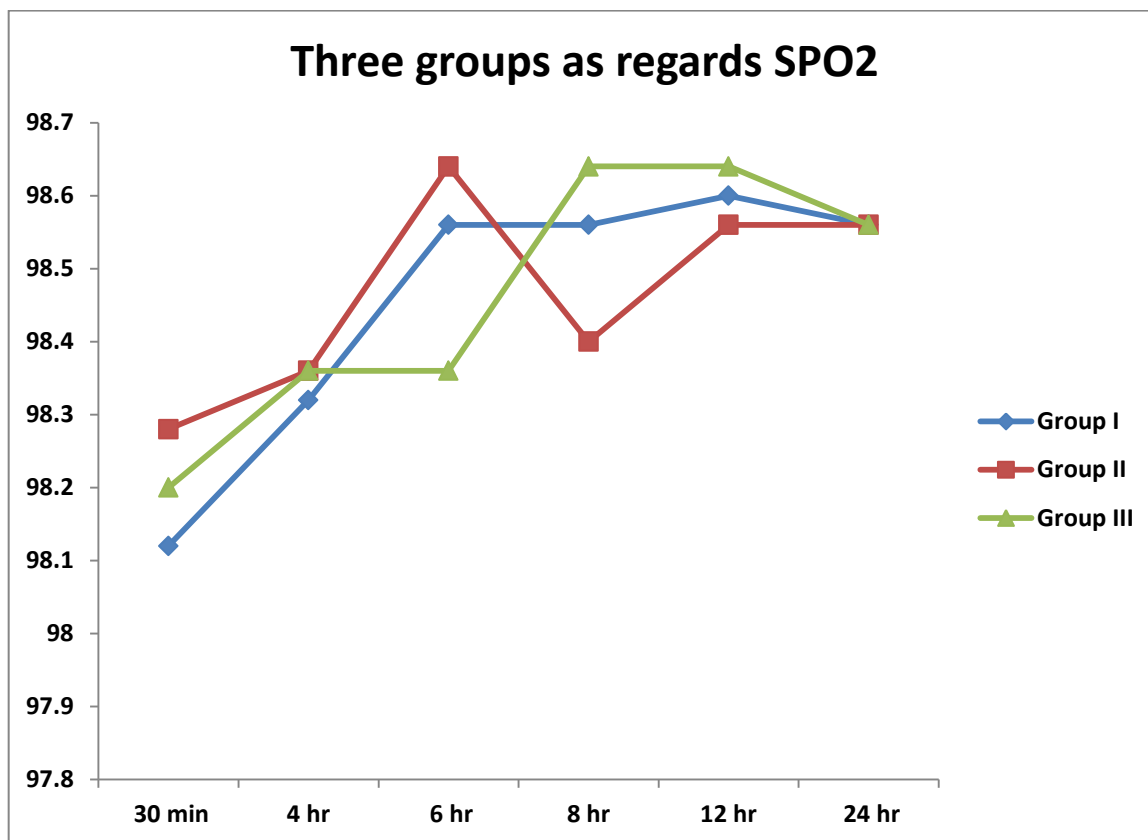


Fig. (19) Shows comparison between three groups as regards SPO2.

4) Respiratory rate:

Respiratory rate showed no statistically significant changes during the course of the present study among the three groups ($P > 0.05$) (**Table 18&Fig20**). There was no apnea and respiratory rate was never less than 12 breath/min.

Table (18): comparison between three groups as regards Respiratory rate:

		Mean	S.D.	Minimum	Maximum	f	p
Resp. rate 30 min	Group I	20.9600	2.13073	17.00	25.00	---	----
	Group II	20.9600	2.13073	17.00	25.00		
	Group III	20.9600	2.13073	17.00	25.00		
Resp. rate 4 hr	Group I	22.2400	1.94251	19.00	26.00	1.3	>0.05
	Group II	21.9600	2.13073	17.00	25.00		
	Group III	21.9600	2.13073	17.00	25.00		
Resp. rate 6 hr	Group I	23.6400	2.01825	20.00	28.00	1.2	>0.05
	Group II	22.9600	2.13073	18.00	26.00		
	Group III	22.8000	2.02073	19.00	26.00		
Resp. rate 8 hr	Group I	23.6400	2.01825	20.00	28.00	1.2	>0.05
	Group II	22.9600	2.13073	18.00	26.00		
	Group III	22.6800	1.77294	20.00	27.00		
Resp. rate 12 hr	Group I	24.1200	1.83303	21.00	28.00	1.3	<0.01
	Group II	23.9600	2.13073	18.00	26.00		
	Group III	23.6800	1.77294	20.00	27.00		
Resp. rate 24 hr	Group I	24.1200	1.83303	21.00	28.00	1.6	>0.05
	Group II	23.1600	2.21133	19.00	27.00		
	Group III	23.5600	1.70978	20.00	28.00		

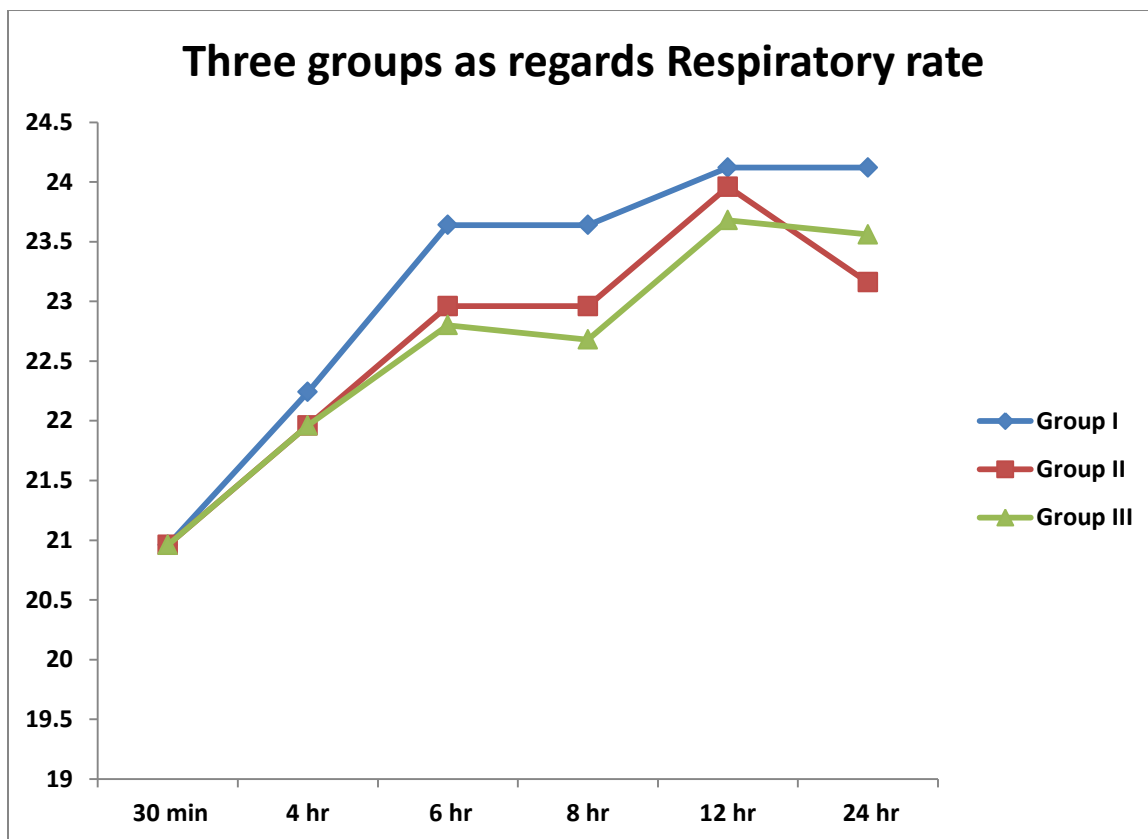


Fig. (20) Shows comparison between three groups as regards Respiratory rate

Table (19): Comparison between three groups as regards type of surgeries done in the three different groups:

Type of surgery	Group I	Group II	Group III
<i>Congenital Inguinal Hernia</i>	11	11	10
<i>Hypospadias</i>	5	4	3
<i>hydrocele</i>	4	5	6
<i>Undescended Testis</i>	5	5	6
total	25	25	25

$$\chi^2 = 1.5$$

$$p > 0.05$$

Postoperative adverse effects:

None of the children had Hypotension, bradycardia or respiratory depression. Two patients (8%) in bupivacaine group, four patients (16%) in bupivacaine neostigmine group and two patients in bupivacaine ketamine group (8%) were suffered from vomiting. By the 4th postoperative hour, no residual motor block could be detected in any of the patients **Table (20)**.

Table (20): comparison between three groups as regards Postoperative adverse effects:

	Group I	Group II	Group III	X2	p
<i>Vomiting</i>	2	4	2	1.1	>0.05
<i>Hypotension</i>	0	0	0	---	---
<i>Bradycardia</i>	0	0	0	---	---
<i>Resp. depression</i>	0	0	0	---	---